

By Academician Ivan Glushchenko

## MICHURINIAN SCIENCE and AGRICULTURE

SCIENCE plays an extremely important part in Soviet agriculture. In the farm development program worked out at the January Plenary Session of the Central Committee of the Communist Party of the USSR it was given an even more prominent role.

The present farm research network comprises 800 institutes and experimental stations, supplemented by more than 1,500 state seed variety testing units that do experimental work right on the farm.

This year model experimental farms are to be set up in almost every district with a view to organizing farm work on a high scientific level. They will be staffed by researchers, agronomists and other specialists who will be field testing new growing and breeding techniques under local soil and climate conditions. The results will be immediately available to farms in the vicinity.

This unity of science and practice is typical of socialist society. They reciprocally enrich and develop each other. The materialist foundation of Soviet agrobiological theory was laid by the Russian naturalist Ivan Michurin who worked during the same period as the American horticulturists Luther Burbank and Nils Hansen.

Michurinian biology, so named in honor of its founder, drew on the best of past biological theory and practice and carried the science a long step forward. Whereas Charles Darwin gave a scientific explanation of the laws governing the development of nature, Michurin, in further developing his teachings, showed how these laws could be used as tools to transform nature.

Michurin's theory opened the way for every biologist to control the characteristics of plants and animals, to alter them for man's benefit. That is why his teachings are referred to in the Soviet Union as creative Darwinism. The cogency of his teachings derives from the fact that he based his study of plant and animal development on the principles of philosophical materialism.

Soviet biologists are consistent materialists and adherents of the Marxist-Leninist theory. They study living nature and its development in terms of its inherent characteristics and conformities and are able to alter these characteristics as practical requirements dictate.

Millions of Michurinist practical farm experimenters are helping to produce new crop varieties and animal breeds. Many working farmers have made notable contributions. Terenti Maltsev is famous throughout the country for developing a farming system for the Transurals that markedly increased crop yields. For his work he was elected an honorary member of the USSR Academy of Agricultural Sciences.

Ivan Michurin died a quarter of a century ago, a sufficiently long period to test and validate his scientific legacy. His teachings have been further developed by his pupils and followers, particularly by the leading Soviet scientist Academician Trofim Lysenko who elaborated the theory of the development of plants in phases. This theory, which maintains that plants pass through successive, qualitatively different stages as they develop, has won wide recognition among biologists and practical growers. Lysenko also formulated a theory of heredity and its variability.

Michurin's teachings are founded on the tenet that metabolism is





IVAN MICHURIN WITH HIS PUPILS (1932)

the basis of heredity, that heredity is the repetition in successive generations of the same type of metabolism.

For many years this theory was the subject of heated debate both in the Soviet Union and abroad. The adherents of the chromosome (gene) theory claimed that heredity is particulate, that it is carried by particles called genes contained in the chromosomes. Michurinists say there are no such things as genes and that the property of heredity is not confined to special particles in the organism but that any part of the organism capable of reproduction has this property.

Cogent proof of the validity of this proposition are the new forms of plants created by Michurinists through vegetative hybridization. Vegetative hybrids, which arise as a result of the coalescence of parts of different plants, bear the characters and properties of their parents, just as in sexual hybridization, and transmit these acquired properties and qualities to their offspring. The apple variety Reinette Bergamotte, bred by Michurin, is a classic example of a vegetative hybrid. Research workers at the Institute of Genetics of the USSR Academy of Sciences have produced many vegetative hybrids of tomato, eggplant, cabbage and other plants.

Michurin and his followers hold that heredity can be altered and, more than that, that it can be altered in a definite direction. This proposition is a result of numerous studies and, more particularly, of experiments that produced vegetative hybrids and transformed spring crops into winter crops, and vice versa, through proper training.

All this research could not help but influence the views of Western geneticists. After many years the opponents of Michurin's theory admit that there are no optical, physical or chemical means at present by which the gene can be studied directly. (M. Demerec, "What Is the Gene?" *American Naturalist*, Vol. 89, No. 844, 1955.)

Not so long ago the experiments and conclusions of Michurinists were rejected outright. Today, however, many Western geneticists are repeating them. There are many examples one could cite to bear this out, but one will be sufficient. At the last International Congress of Geneticists in Canada (1958), a special section was organized to discuss problems of vegetative hybridization. This is the idea that Charles Darwin put forward, that Michurin and his followers developed but that Western geneticists flatly rejected.

Nor can the fact be disregarded that adherents of the chromosome theory acknowledge the possibility of mutations—hereditary changes—induced in a definite direction. In this respect the work with yeast done by the American geneticist Carl Lindegren is of special interest. The studies are summed up in his article "The Stability of the Gene" in *Science*, 1956, and in the abstract from his report to the Tenth Genetics Congress on "The Recombination of the Complex Locus in the Yeast *Saccharomyces*."

These examples speak for the viability of Michurin's materialist teachings. They continue to gain more and more supporters. One of Japan's foremost cytogeneticists, Professor Hazime Matsuura, on the basis of his own experiments, acknowledged the validity of Michurin's theory and now heads the mass movement of farmer-experimenters joined in the Friends of Michurin Association in all fifty of the country's prefectures. The newspaper *Michurin Nogio* (*Michurin Agriculture*) has been published in Japan for many years. Within a few years four congresses of Michurin supporters were held in Tokyo.

In France the Friends of Michurin Society has been thriving for more than ten years. It disseminates the teachings of Michurin and those of the French materialist biologist Lucien Daniel. Its *Bulletin* publishes scientific studies and results achieved by practical workers.

There are adherents of Michurin's teachings in England, Belgium, Italy, Switzerland, India, China, Bulgaria and many other countries.

Michurin achieved extraordinary success in his efforts to transform the plant world. He created more than 300 new fruit varieties. But to really comprehend the magnitude of his work we must remember that he did not merely improve existing varieties but actually created, under growing conditions peculiar to the North, plant forms that normally grow in the South or are found wild in the East. To mention a few, there are the apricot, sweet cherry and Actinidia varieties and the many apple, pear and plum varieties that Michurin bred in the town of Michurinsk (formerly Kozlov) in Central Russia.

Michurin's pupil Mikhail Lysovenko continued his work of making the North horticultural country. Siberian orchard acreage keeps ex-

panding year by year. Kiev horticulturists have bred several winter-hardy peach varieties of fine quality in places where they had never grown before. This work, begun by another noted follower of Michurin, Academician Nikolai Kashchenko, is being successfully developed by researchers of the Botanical Garden of the Ukrainian Academy of Sciences and the Ukrainian Institute of Horticulture.

Michurin's pupils and followers have enormously enriched the plant and animal world. Today 2,578 varieties of farm plants are grown in the Soviet Union. Most of the new forms were created by Soviet plant breeders; only 162 are of foreign origin.

The grand old man of Russian plant breeding is Academician Vasili Yuryev who began his work early in the century. He is the creator of 19 wheat, barley, corn and other farm crop varieties grown over an area of about five million acres.

Michurinist plant breeders Pavel Lukyanenko and Fyodor Kirichenko have created several varieties of winter wheat, that most vital of food plants. These varieties, despite their comparative youth, are already sown over millions of acres to supply Soviet consumers with additional hundreds of millions of bushels of wheat.

Academician Vasili Pustovoi has made breeding sunflowers, an important Soviet crop, his life work. Nikita Khrushchev called Pustovoi "the god of the sunflower," a characterization not too wide of the mark for this botanical wonder worker who has bred sunflower varieties with seeds having an oil content of 52-53 per cent, almost twice that of the ordinary sunflower. His colleague Academician Leonid Zhdanov was equally successful in creating varieties with high oil content.

Soviet farmers are generally acquainted with the many advanced agrotechnical methods worked out by the country's agricultural scientists. They include vernalization of spring grain crops and potatoes, summer planting of potatoes, grass sowing in summer, additional pollination of farm crops, intra- and intervarietal crossing for seed-growing purposes, hill sowing and planting, etc.

Michurinist stockmen have created more than forty new breeds of cattle, sheep, pigs, horses and poultry. Among the new high-yield milkers is the well-known Kostromskaya breed, the best of which give as much as 10,000-11,000 quarts of milk a year. Belogolovaya and Sychovskaya are among the other very productive dairy cattle breeds.

The work of Soviet biologists and animal breeders in artificial insemination has won them world renown. The methods they have devised not only rationalize propagation techniques but speed up the process of quality improvement in herd pedigree.

Studies are under way at the experimental base of the Institute of Genetics of the USSR Academy of Sciences in the Gorki Leninskie State Farm under the supervision of Academician Trofim Lysenko to increase the fat content of milk. The cows bred in these researches yield milk with a fat content of more than five per cent. Many animals of this high-yield stock have been sent to the collective and state farms.

Academician Lysenko's aim is to make the fruits of his investigations available to every collective and state farm in the Soviet Union. He hopes to increase the average fat content of the country's milk from 3.6-3.7 to 4.5 per cent within a period of five to seven years. The practical implications of these studies are apparent—an increase of only 0.1 per cent in the fat content is equivalent to an added 800 million quarts of milk yearly.

Soviet scientists follow agriculture developments abroad with great interest and make every effort to build close ties with their foreign counterparts. Exchange of findings helps to enrich farm science and make for larger crop yields and a greater abundance of food products throughout the world.

Soviet science, being in close union with practice, is actively participating in the fulfillment of the task set by the January Plenary Session of the Central Committee of the Communist Party of the Soviet Union—to create within a short period an abundance of produce for the people and thus to raise still higher the country's standard of living.

The farm development program worked out at the January Plenary Session has opened new and bold vistas for research in agricultural science. At the service of the researcher are fine modern laboratories, experimental fields, big operating farms and the great body of theoretical and practical pioneer work in agrobiological work done by Ivan Michurin and his successors.